

RES LIGUSTICAE

CCXXXVII

PATRICK BRUNET-LECOMTE (*) AND ROBERTO E. ROSI (**)

COMPARATIVE MORPHOMETRY OF THE FIRST LOWER
MOLAR IN *MICROTUS (TERRICOLA) MULTIPLEX*
(FATIO, 1905) (RODENTIA, ARVICOLIDAE) OF THE
LUNIGIANA (ITALY).

INTRODUCTION

The Fatio's vole *Microtus (Terricola) multiplex* is probably present in Italy since last upper Pleistocene, despite the fact that its identification from other species of subgenus *Terricola* is not easy (CAPIZZI & SANTINI, 1999). In Italy, the present-day distribution is not totally known. *M. (T.) multiplex* is considered to be an alpine and north-apennine species (LANZA & AZZAROLI, 1970). It lives scattered through the Alps, the north of the Apennines and as far as the north of Tuscany (SANTINI 1978; CAPIZZI & SANTINI, 1999) (Fig. 1). The species might be present also in the central Apennines (in Abruzzo) (AMORI *et al.*, 1984).

Generally *M. (T.) multiplex* is not found in mediterranean biotopes (AMORI *et al.*, 1984), but some specimens were found in typical mediterranean stations of Lunigiana like Porto Venere (La Spezia) (SANTINI & FARINA, 1978) and Pegazzano (La Spezia) (ROSI, 2000). In these stations, *M. (T.) savii* (de Sélys Longchamps) was not found, even though this species is present, on the contrary of *M. (T.) multiplex*, at few kilometers in the lowlands near the cost (SANTINI & FARINA, 1978).

This work is based on the study of different samples of *M. (T.) multiplex* found in pellets of barn owl *Tyto alba* (Scop.) from lunigianese stations in provinces of Massa and La Spezia (Fig. 2).

(*) UMR CNRS 5561 Biogéosciences et Laboratoire de Paléobiodiversité et de Préhistoire de l'Ecole Pratique des Hautes Etudes, Centre des Sciences de la Terre, Université de Bourgogne, 6 Bd. Gabriel, F-21000 Dijon (France)

(**) Via Canarecchia 5, I-19021 Monti di Arcola (La Spezia, Italy).

The Ligurian stations are close to the sea coast, and they have a wet mediterranean climate: Pegazzano (SP) 150 m a.s.l.; Arcola (SP) 70 m a.s.l.; Isola (SP) 275 m a.s.l. The average annual temperature is 15.4°C in La Spezia, with an annual precipitation of 1404 mm (GAUDENZO *et al.*, 1998). Way far from the sea, in the stations of Lunigiana, the temperature decreases and the precipitation progressively raises (Pontremoli, annual average temperature=12.4°C, humidity=71% and precipitation=1667 mm, according to M. Ratti, pers. data); the stations of Lusuolo (MS) 179 m a.s.l., Malgrate (MS) 251 m a.s.l., Groppoli (MS) 363 m a.s.l., Pontremoli (MS) 236 m a.s.l. and Gravagna san Rocco (MS) 690 m a.s.l. are in this region. The stations of Fivizzano (MS) 326 m a.s.l. and Mazzola (MS) 449 m a.s.l. are in the Aulella valley, on the east part of Lunigiana.

MATERIALS

We examined first lower molars (M_1) of 10 populations from Italy (denoted ITA): Pontremoli (Massa, Italy), $n=58$, Gravagna san Rocco (Massa, Italy), $n=9$, Pegazzano (La Spezia, Italy), $n=14$, Arcola (La Spezia, Italy), $n=8$, Isola (La Spezia, Italy), $n=6$, Malgrate (Massa, Italy), $n=20$, Lusuolo (Massa, Italy), $n=14$, Gròppoli (Massa, Italy), $n=6$, Mazzola (Massa, Italy), $n=48$, Fivizzano (Massa, Italy), $n=12$.

The materials have been collected in the years 1993–1996 and belong to the Rosi collection (Arcola, La Spezia, Italia); a part of them is deposited in the Centre des Sciences de la Terre, Université de Bourgogne (Dijon, France).

The 10 populations were grouped according their respective geographical distribution (Figure 2): group A: Pontremoli and Gravagna San Rocco; group B: Pegazzano, Arcola and Isola; group C: Malgrate, Lusuolo and Gròppoli; group D: Mazzola and Fivizzano.

We compared Italian populations with:

- 3 populations from Briançonnais (denoted BRI): Col du Lautaret (Hautes-Alpes, France) $n=48$, Col du Montgenèvre (Hautes-Alpes, France) $n=17$, Les Vigneaux (Hautes-Alpes, France) $n=10$;

- 7 populations from Prealps of the Vercors, Trièves and around (denoted PRA): La Chapelle-en-Vercors (Drôme, France) $n=12$, Chabeuil (Drôme, France) $n=20$, Marsaz (Drôme, France) $n=3$, Hauterives (Drôme, France) $n=2$, Saint-Martin-de-la-Cluze (Isère, France)

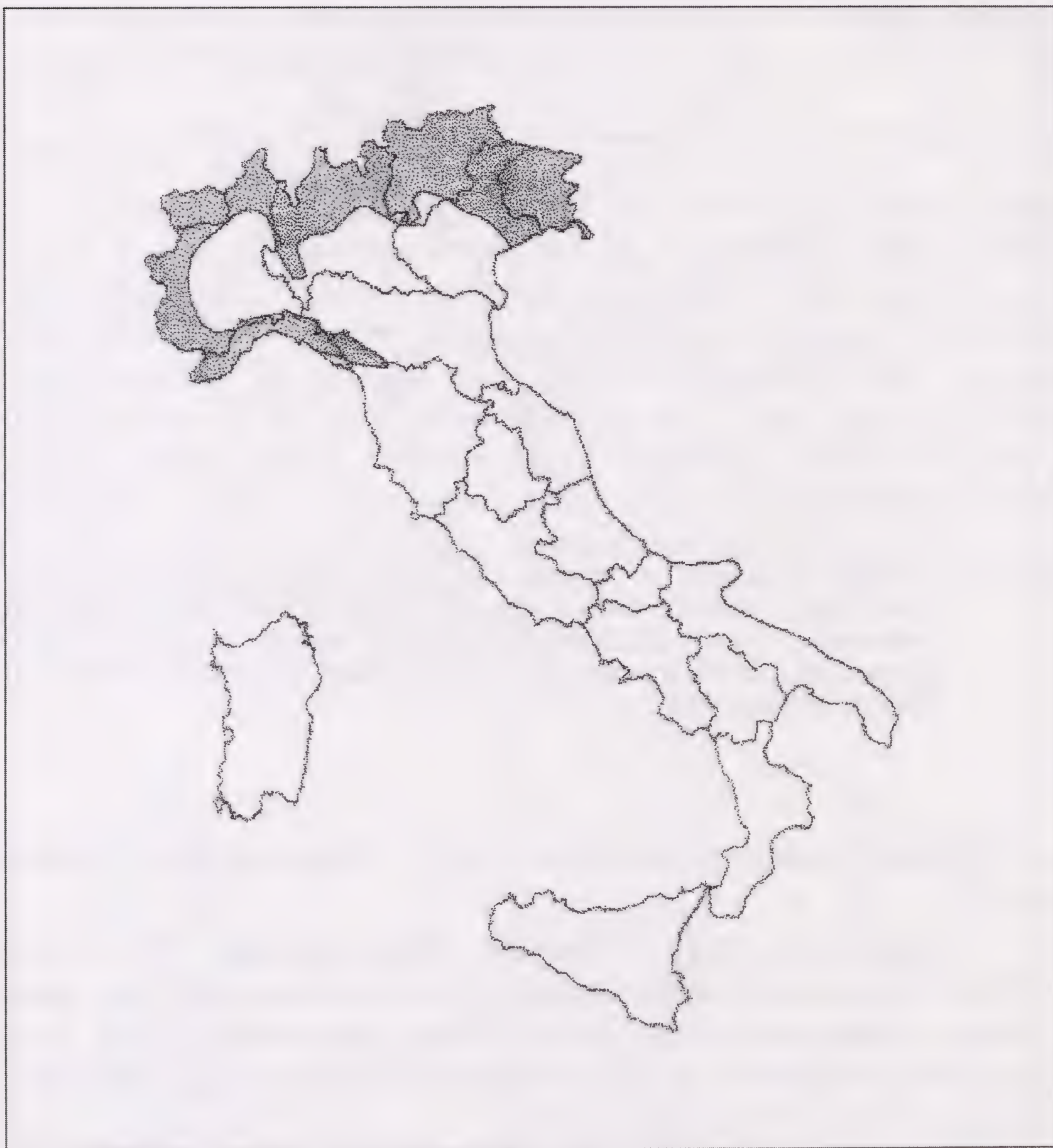


Fig. 1 - Present-day distribution of *Microtus (Terricola) multiplex* in Italy.

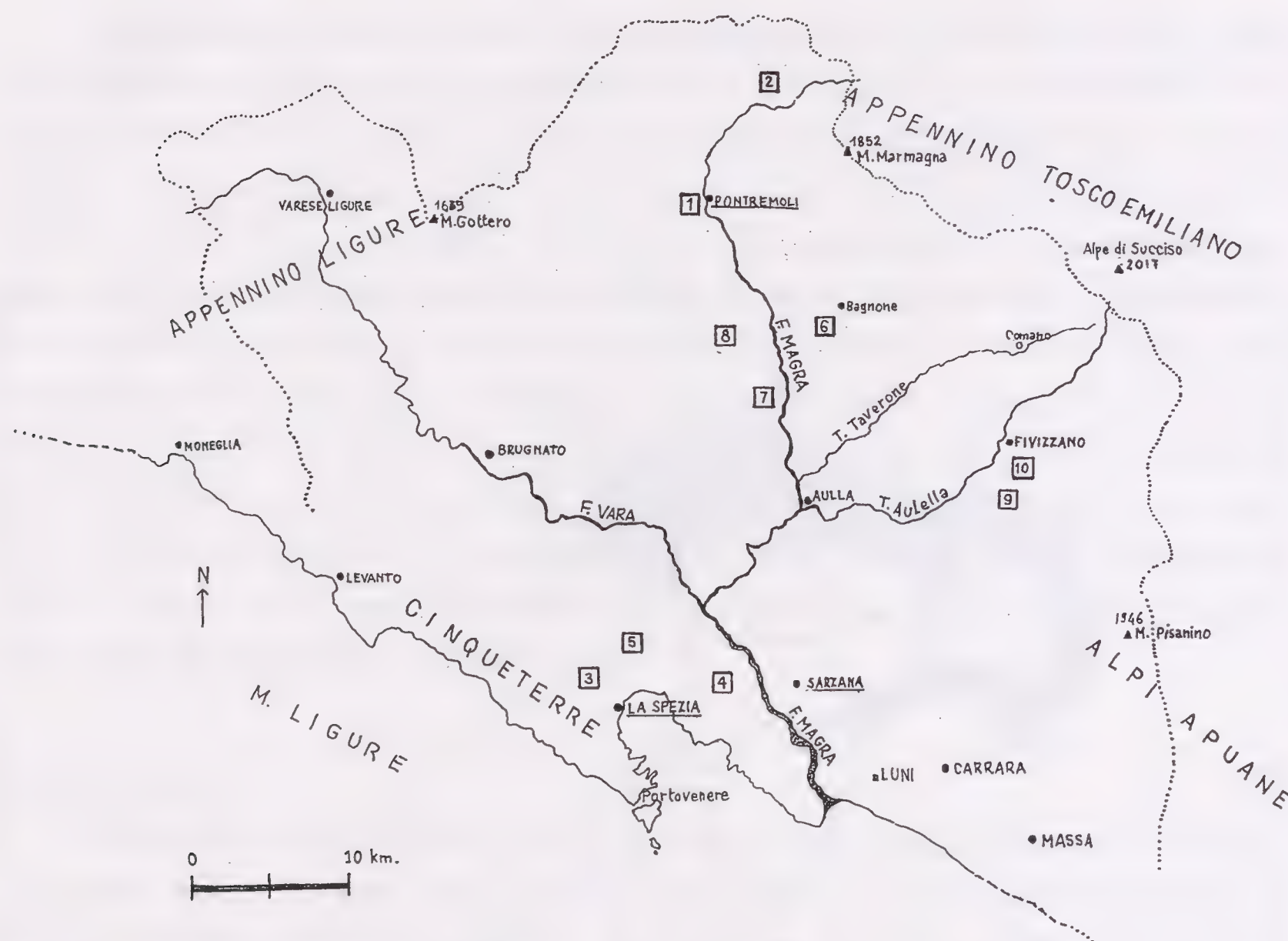


Fig. 2 - Localities of samples of *Microtus (Terricola) multiplex* populations in Lunigiana (Italy): Pontremoli (Massa) (denoted 1), Gravagna San Rocco (Massa) (2), Pegazzano (La Spezia) (3), Arcola (La Spezia) (4), Isola (La Spezia) (5), Malgrate (Massa) (6), Lusuolo (Massa) (7), Gròppoli (Massa) (8), Mazzola (Massa) (9), Fivizzano (Massa) (10).

n=10, Saint-Romans (Isère, France) n=24, Chantesse (Isère, France) n=14;

- 7 population from Ticino and Wallis (denoted TIC): Gudo (Ticino, Switzerland) n=12, Bedano (Ticino, Switzerland) n=4, Isonne (Ticino, Switzerland) n=4, Meride (Ticino, Switzerland) n=16, Bioggio (Ticino, Switzerland) n=16, Varenzo (Ticino, Switzerland) n=11, Zermatt (Wallis, Switzerland) n=12.

The populations from Ticino, assigned to the nominative subspecies *multiplex* (Fatio, 1905), described from Lugano (Ticino, Switzerland), and the population from Zermatt, assigned to the subspecies *fatioi* (Mottaz, 1909), described from Zermatt (Wallis, Switzerland), are pooled in the same geographical group due to the small sample size (n=12) of the population from Zermatt;

The populations from Briançonnais were assigned to the subspecies *druentius* (Miller, 1912), described from Terres-Plaines near Barcelonnette (Alpes-de-Haute-Provence, France);

The populations from Prealps and Trièves were assigned to the subspecies *niethammeri* (Brunet-Lecomte et Volobouev, 1994), described from Saint-Martin-de-la-Cluze (Isère, France), locality included in this geographical sample.

METHODS

Twenty three variables, denoted V1 to V23 (Figure 3), were taken on the occlusal surface of the M_1 (BRUNET-LECOMTE, 1988). We calculated 11 variables: the development of the anterior part $AP=(V6-V3)/V6*100$, the tilt of the pitymyan rhombus $PR=V4-V3$, the closure of the anterior loop $AL=(V20-V18)/V21*100$, the ratio length/width of M_1 $V6V21=V6/V21$ and the 7 other variables of the anterior part of the M_1 $V10V9=(V10-V9)/V6*100$, $V11V9=(V11-V9)/V6*100$, $V12V10=(V12-V10)/V6*100$, $V12V11=(V12-V11)/V6*100$, $V18V17=(V18-V17)/V21*100$, $V19V17=(V19-V17)/V21*100$ and $V20V19=(V20-V19)/V21*100$.

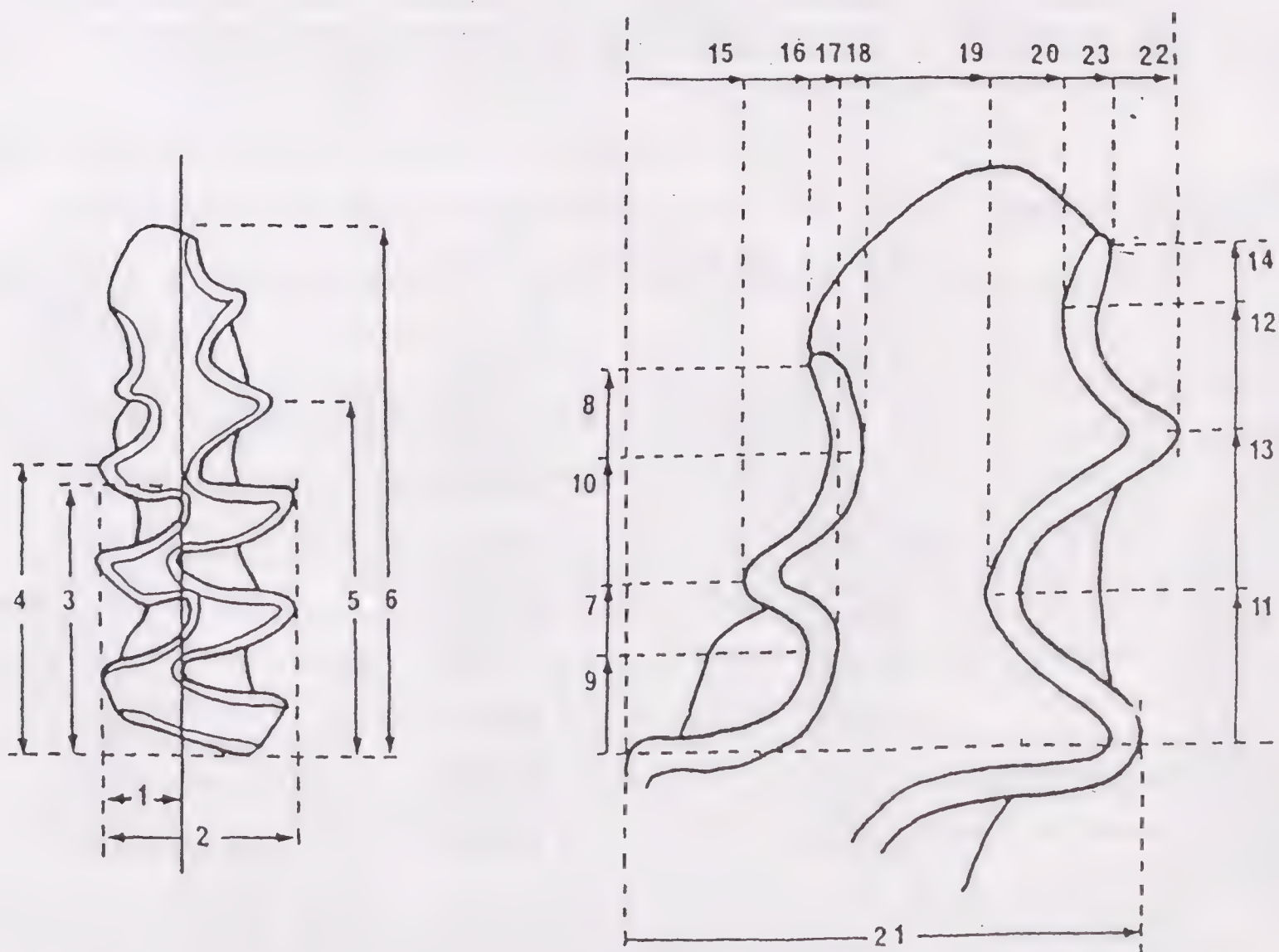


Fig. 3 - Morphometry of the first lower molar of *Microtus (Terricola) multiplex*.

The comparative morphometry of M_1 was running on the total length of the M_1 $TL=V6$ and the 11 calculated variables AP, PR, AL, V6V21, V10V9, V11V9, V12V10, V12V11, V18V17, V19V17 and V20V19. The precision of measures was 10^{-3} mm, the variables TL and PR were expressed in mm, the other variables were without unit.

The one-way analysis of variance (ANOVA) was used to compare the 12 criteria among Italian groups and materials from Briançonnais, Prealps-Trièves and Ticino-Wallis, completed by the Scheffé's test and the Dunnett's test if necessary.

RESULTS AND DISCUSSION

The morphology of the M_1 of Italian populations was visually similar to those of other populations of *M. (T.) multiplex*, characterised by a well developed anterior part of the M_1 ($AP>50$) and a closed anterior loop ($AL<30$).

Three sets of ANOVA were run (Table 1):

1 – between the 4 geographical regions: 7 variables were significantly different: TL, AP, PR, AL, V6V21, V12V11 and V20V19.

2 – between the 4 Italian groups: 6 variables were significantly different: TL, V10V9, V11V9, V12V10, V12V11 and V20V19.

Tab. 1
ANOVA

	Region	Group	Group+TIC
TL	<0.0001	<0.0001	<0.0001
AP	<0.0001	0.1313	0.2151
PR	<0.0001	0.2023	0.1272
AL	<0.0001	0.0930	0.1471
V6V21	<0.0001	0.1510	0.0113
V10V9	0.5424	0.0038	0.0046
V11V9	0.0181	0.0005	0.0008
V12V10	0.0955	0.0253	0.0728
V12V11	<0.0001	0.0013	0.0044
V18V17	0.4702	0.0699	0.0864
V19V17	0.7472	0.7810	0.7060
V20V19	<0.0001	0.0258	0.0362

Tab. 1 - Analysis of variance (probability) for each of the 3 factors : geographical regions (denoted Region), Italian groups (denoted Group) and Italian groups of Italy compared to the Ticino and Wallis sample (denoted Group+TIC).

3 – between the 4 groups of Italy compared to Ticino and Wallis regions: 6 variables were significantly different: TL, V6V21, V10V9, V11V9, V12V11 and V20V19.

ANOVA AMONG THE GEOGRAPHICAL REGIONS

The Scheffé's test (Table 2) showed that the Italian sample was significantly different ($p < 0.05$) from:

- the Briançonnais sample for 6 criteria: TL (mean=2.787 mm versus 2.433 mm), AP (mean=52.117 versus 51.743), V6V21 (mean=2.632 versus 2.570), V11V9 (mean=1.120 versus 1.677), V12V11 (mean=16.336 versus 15.573) and V20V19 (mean=12.983 versus 17.587);

- the Prealps-Trièves sample for 5 criteria: TL (mean=2.787 mm versus 2.620 mm), AP (mean=52.117 versus 50.145), PR (mean=0.040 mm versus -0.006 mm), V6V21 (mean=2.632 versus 2.560) and V12V11 (mean=16.336 versus 15.548);

- the Ticino and Wallis sample for none criterion.

Italian sample was characterised by a large size of the M_1 (mean TL=2.787 mm), a well developed anterior part (mean AP=52.117), a closed anterior loop (mean AL=20.332), a small difference for V11-V9 (mean V11V9=1.120) and V20-V19 (mean V20V19=12.983), and a large difference for V12-V11 (mean V12V11=16.336).

Summarising, the morphometry of the M_1 of Italian sample was generally similar to the Ticino and Wallis sample.

ANOVA AMONG THE ITALIAN GROUPS

The Scheffé's test (Table 3) showed that:

- the group A was significantly different ($p < 0.05$) from the group B for 2 criteria: V11V9 (mean=1.298 versus 0.476) and V20V19 (mean=14.138 versus 10.717), and from the group D for 1 criterion: TL (mean=2.811 mm versus 2.720 mm);

- the group B was significantly different ($p < 0.05$) from the group A for 2 criteria: V11V9 and V20V19, from the group C for 1 criterion: TL (mean=2.895 mm versus 2.774 mm), and from the group D for 3 criteria: TL (mean=2.895 mm versus 2.720 mm), V11V9 (mean=0.476 versus 1.233) and V12V11 (mean=16.997 versus 15.852 mm);

Tab. 2
TL (in mm)

Region	N	Mean	Std Dev	Minimum	Maximum	Scheffé's test
TIC	75	2.721	0.213	2.180	3.030	A
BRI	75	2.433	0.189	2.070	2.790	C
PRA	85	2.620	0.163	2.300	3.010	B
ITA	195	2.787	0.155	2.410	3.170	A

AP (no unit)

Region	N	Mean	Std Dev	Minimum	Maximum	Scheffé's test
TIC	75	52.069	1.332	49.000	55.319	A
BRI	75	51.743	1.634	46.888	55.072	A
PRA	85	50.145	1.557	45.022	52.896	B
ITA	195	52.117	1.389	48.289	55.556	A

PR (in mm)

Region	N	Mean	Std Dev	Minimum	Maximum	Scheffé's test
TIC	75	0.032	0.036	-0.060	0.100	A
BRI	75	0.042	0.050	-0.090	0.150	A
PRA	85	-0.006	0.036	-0.150	0.080	B
ITA	195	0.040	0.037	-0.070	0.150	A

AL (no unit)

Region	N	Mean	Std Dev	Minimum	Maximum	Scheffé's test
TIC	75	21.176	8.023	8.421	48.485	B
BRI	75	25.852	9.871	10.227	58.696	A
PRA	85	18.423	5.834	0.893	30.097	B
ITA	195	20.332	7.419	5.607	44.554	B

V6V21 (no unit)

Region	N	Mean	Std Dev	Minimum	Maximum	Scheffé's test
TIC	75	2.582	0.119	2.296	2.837	A B
BRI	75	2.570	0.132	2.323	2.906	B
PRA	85	2.560	0.131	2.189	2.910	B
ITA	195	2.632	0.142	2.282	3.326	A

V11V9 (no unit)

Region	N	Mean	Std Dev	Minimum	Maximum	Scheffé's test
TIC	75	1.369	1.329	-1.394	4.545	A B
BRI	75	1.677	1.571	-1.327	5.512	A
PRA	85	1.361	1.238	-3.175	4.603	A B
ITA	195	1.120	1.236	-2.062	4.377	B

V12V11 (no unit)

Region	N	Mean	Std Dev	Minimum	Maximum	Scheffé's test
TIC	75	16.371	1.647	11.864	20.229	A
BRI	75	15.573	1.717	11.024	19.485	B
PRA	85	15.548	1.597	12.346	20.238	B
ITA	195	16.336	1.545	12.100	21.649	A

V20V19 (no unit)

Region	N	Mean	Std Dev	Minimum	Maximum	Scheffé's test
TIC	75	14.136	6.578	1.053	28.947	B
BRI	75	17.587	4.959	8.333	27.835	A
PRA	85	11.060	3.948	0.000	21.698	C
ITA	195	12.983	5.319	0.185	25.455	B C

Tab. 2 - Descriptive statistics and Scheffé's test of the criteria significant for the factor geographical region. Scheffé's test: samples with the same letter are not significantly different ($p \geq 0.05$).

- the group C was significantly different ($p < 0.05$) from the group B for 1 criterion: TL, and from the group D for 2 criteria: V10V9 (mean=14.709 versus 13.696) and V12V11 (mean=16.817 versus 15.852);
- the group D was significantly different ($p < 0.05$) from the group A for 1 criterion: TL, from the group B for 3 criteria: TL, V11V9 and V12V11, and from the group C for 2 criteria: V10V9 and V12V11;
- none difference was found between the groups A and C.

The comparison with the sample from Ticino and Wallis as a reference by the way of the Dunnett's test precised that:

- the group A was significantly different ($p < 0.05$) from the Ticino and Wallis sample for 1 criterion (TL: mean = 2.811 mm versus 2.720 mm);

Tab. 3
TL (in mm)

Group	N	Mean	Std Dev	Minimum	Maximum	Scheffé's test	Dunnett's test
							mean TIC=2.721
A	67	2.811	0.163	2.460	3.170	A B	S
B	28	2.895	0.097	2.660	3.070	A	S
C	40	2.774	0.134	2.460	3.000	B C	NS
D	60	2.720	0.149	2.410	3.030	C	NS

V6V21 (no unit)

Group	N	Mean	Std Dev	Minimum	Maximum	Dunnett's test
						mean TIC=2.582
A	67	2.633	0.132	2.420	2.932	NS
B	28	2.682	0.181	2.500	3.326	S
C	40	2.603	0.134	2.282	2.935	NS
D	60	2.629	0.134	2.379	3.000	NS

V10V9 (no unit)

Group	N	Mean	Std Dev	Minimum	Maximum	Scheffé's test	Dunnett's test
							mean TIC=14.574
A	67	14.616	1.735	9.854	17.871	A B	NS
B	28	14.439	0.935	12.542	16.140	A B	NS
C	40	14.709	1.603	11.661	18.315	A	NS
D	60	13.696	1.695	8.897	17.143	B	S

V11V9 (no unit)

Group	N	Mean	Std Dev	Minimum	Maximum	Scheffé's test	Dunnett's test
							mean TIC=1.369
A	67	1.298	1.210	-1.091	4.377	A	NS
B	28	0.476	1.128	-0.741	3.436	B	S
C	40	0.756	1.126	-1.767	3.663	A B	S
D	60	1.465	1.233	-2.062	3.614	A	NS

V12V10 (no unit)

Group	N	Mean	Std Dev	Minimum	Maximum	Scheffé's test
A	67	2.888	1.583	-0.755	6.709	A
B	28	3.034	1.287	0.345	6.969	A
C	40	2.863	1.642	-1.498	6.711	A
D	60	3.620	1.394	0.000	6.873	A

V12V11 (no unit)

Group	N	Mean	Std Dev	Minimum	Maximum	Scheffé's test
A	67	16.206	1.454	13.028	19.870	A B
B	28	16.997	1.653	13.448	20.139	A
C	40	16.817	1.347	14.583	20.619	A
D	60	15.852	1.553	12.100	21.649	B

V20V19 (no unit)

Group	N	Mean	Std Dev	Minimum	Maximum	Scheffé's test	Dunnett's test
							mean TIC=14.136
A	67	14.138	5.381	1.852	24.742	A	NS
B	28	10.717	4.397	3.636	20.561	B	S
C	40	12.236	4.593	3.571	25.000	A B	NS
D	60	13.249	5.783	1.942	25.455	A B	NS

Tab. 3 - Descriptive statistics, Scheffé's test and Dunnett's test of the criteria significant for the factor Italian group. Scheffé's test: samples with the same letter are not significantly different ($p \geq 0.05$).
Dunnett's test: NS = sample not significantly different ($p \geq 0.05$) from Ticino and Wallis sample, S = sample significantly different ($p < 0.05$) from Ticino and Wallis sample.

- the group B was significantly different ($p < 0.05$) from the Ticino and Wallis sample for 4 criteria (TL: mean = 2.895 mm versus 2.720 mm, V6V21 : mean=2.682 versus 2.582, V11V9 : mean=0.476 versus 1.369 and V20V19 : mean=10.717 versus 14.136);
- the group C was significantly different ($p < 0.05$) from the Ticino and Wallis sample for 1 criterion (V11V9: mean = 0.756 versus 1.369);

- the group D was significantly different ($p < 0.05$) from the Ticino and Wallis sample for 1 criterion (V10V9: mean = 13.696 versus 14.574).

Summarising, the group B was the most different from the Ticino and Wallis sample, and within the Italian samples, the groups B and D were the most separated, while the groups A and C occupied an intermediate position between the groups B and D.

SYSTEMATIC POSITION OF THE ITALIAN POPULATION

Previous studies (GRAF & MEYLAN, 1980, BRUNET-LECOMTE & VOLOBOUEV, 1994, HARING *et al.*, 2000) have pointed-out the genetic and karyological polymorphism of the species. GRAF & MEYLAN (1980) studied by electrophoretic and cytogenetic analyses the populations of Varenzo (Ticino) and Fivizzano (Massa), 2 samples belonging to the Ticino and Wallis sample (Varenzo) and to the sample D (Fivizzano) of the Italian group, reporting a very small genetic distance (Nei's distance = 0.01) between the samples of Varenzo and Fivizzano; the sample from Fivizzano differed from the sample from Varenzo by the loss of a pair of acrocentric autosomes, while the sex chromosomes were similar to those from Varenzo sample.

The morphometric analysis of the M_1 confirmed the close relationship between the group D (Fivizzano and Mazzola) and the Ticino and Wallis sample and showed a medium difference, in the size like in the shape, between the group D (Fivizzano and Mazzola) and the group B (the 3 samples of La Spezia). This difference is interesting to report, because of the geographical position of the group B near the sea.

Recently HARING *et al.* (2000) have confirmed that the Tuscan populations belong to *M. (T.) multiplex*.

The synthesis of genetic, cytogenetic and morphometric data leads to propose the following hypothesis: because of the small genetic distance between the samples of Varenzo and Fivizzano, the karyotypic and the morphometric differences found between the Ticinese and the Italian populations are recent.

The available data lead to classify the Italian population in the nominative subspecies *multiplex*.

CONCLUSIONS

The morphometric analysis of the M_1 confirmed the close relationships displayed by genetic and cytogenetic analyses between Tici-nese and Lunigianese populations of *M. (T.) multiplex*. On the other hand, this analysis showed a medium difference between the sample from the coast of the province of La Spezia (Pegazzano, Arcola and Isola) and the samples from the province of Massa, particularly the sample D (Mazzola and Fivizzano). At the moment it is not possible to know if this difference is correlated to genetic difference between the populations or has an environmental explanation. Next studies, like genetic analyses, will try to explain this difference.

REFERENCES

- AMORI G., CRISTALDI M. & CONTOLI L., 1984 – Sui roditori (Gliridae-Arvicolidae-Muridae) dell'Italia peninsulare in rapporto all'ambiente bioclimatico mediterraneo – *Animalia*, Catania, 11, (1-3): 217-269.
- BRUNET-LECOMTE P., 1988 – Les campagnols souterrains (*Terricola*, Arvicolidae, Rodentia) actuels et fossiles d'Europe occidentale – Thèse de Doctorat, Université de Bourgogne, 146 pp.
- BRUNET-LECOMTE P. & VOLOBOUEV V., 1994 – Comparative morphometry and cytogenetic of *Microtus (Terricola) multiplex* (Arvicolidae, Rodentia) of the western French Alps – *Zeitschr. Säugetierkunde*, Hamburg und Berlin, 59: 116-125.
- CAPIZZI D. & SANTINI L., 1999 – Roditori – in: Iconografia dei Mammiferi d'Italia, a cura di M. Spagnesi e S. Toso, Istituto Nazionale per la Fauna Selvatica "A. Ghigi", Ozzano nell'Emilia, 123 pp.
- GAUDENZO P., NARDELLI R., GIACOMAZZI F., SIMONINI L. & DEGIORGIS L., 1998 – Fiori e piante alla Spezia e Lunigiana – Luna Editore, La Spezia, 21 pp.
- GRAF J. D. & MEYLAN A., 1980 – Polymorphisme chromosomique et biochimique des *Pitymys multiplex* (Mammalia, Rodentia) – *Zeitschr. Säugetierkunde*, Hamburg und Berlin, 45: 133-148.
- HARING E., HERZOG-STRASCHIL B. & SPITZENBERGER F., 2000 – Phylogenetic analysis of Alpine vole *Microtus multiplex* complex using the mitochondrial control region – *Journ. zool. Syst. evol. Res.*, Berlin, 38: 231-238.
- LANZA B. & AZZAROLI M. L., 1970 – I mammiferi delle Alpi apuane – *Lavori Soc. ital. Biogeogr.*, Forlì, n.s., 1: 677-714.
- ROSI E. R., 2000 – Prime osservazioni sulla microteriofauna in un sito alla periferia della Spezia attraverso la dieta di Barbagianni, *Tyto alba* (Scopoli, 1769) – in: Fauna 2000. Indagini sulla fauna del comprensorio provinciale spezzino, Atti del

Convegno, La Spezia, Luna Editore, 63 pp.

SANTINI L. & FARINA A., 1978 – Roditori e insettivori predati da *Tyto alba* nella Toscana settentrionale - *Avocetta*, Parma, n. s., 1: 49-60.

SANTINI L., 1983 – I Roditori italiani d'interesse agrario e forestale – Collana Progr. finalizzato "Promozione della Qualità dell'Ambiente" AQ/1/232, C.N.R., Padova, 168 pp.

ABSTRACT

The comparative morphometry of the first lower molar of different populations of *Microtus (Terricola) multiplex* from Lunigiana (Italy) confirmed that these populations are close to the nominative subspecies *multiplex* from Ticino (Switzerland) and showed that, within the Lunigianese populations, the population of the province of la Spezia is the most differentiated from the nominative subspecies.

RIASSUNTO

La morfometria comparativa del primo molare inferiore delle diverse popolazioni di *Microtus (Terricola) multiplex* (Fatio) della Lunigiana (Italia) ha confermato che queste popolazioni sono in stretta relazione con la sottospecie topotipica del Canton Ticino (Svizzera); inoltre, fra le popolazioni lunigianesi, quella della provincia della Spezia appare la più differenziata dalla sottospecie nominale.